



ABSTRACT AND BIOGRAPHY

When Failure Means Success: Accepting Risk in Aerospace Development

Over the last three decades, NASA has been diligent in qualifying systems for human space flight. As the Agency transitions from operating the Space Shuttle, its employees must learn to accept higher risk levels to generate the data needed to certify its next human space flight system. The Marshall Center's Engineering workforce is developing the Ares I crew launch vehicle and designing the Ares V cargo launch vehicle for safety, reliability, and cost-effective operations. This presentation will provide a risk retrospective, using first-hand examples from the Delta Clipper-Experimental Advanced (DC-XA) and the X-33 single-stage-to-orbit flight demonstrators, while looking ahead to the upcoming Ares I-X uncrewed test flight. The DC-XA was successfully flown twice in 26 hours, setting a new turnaround-time record. Later, one of its 3 landing gears did not deploy, it tipped over, and was destroyed. During structural testing, the X-33's advanced composite tanks were unable to withstand the forces to which it was subjected and the project was later cancelled. These are examples of successful failures, as the data generated are captured in databases used by vehicle designers today. More recently, the Ares I-X flight readiness review process was streamlined in keeping with the mission's objectives, since human lives are not at stake, which reflects the beginning of a cultural change. Failures are acceptable during testing, as they provide the lessons that actually lead to mission success. These and other examples will stimulate the discussion of when to accept risk in aerospace projects.

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Daniel (Dan) L. Dumbacher is Director of the Marshall Space Flight Center's Engineering Directorate, where he leads a workforce of about 1,400 civil servants and 1,200 contractors. The Directorate performs sustaining engineering for Space Shuttle propulsion elements, manages scientific operations on the International Space Station, and is developing the Ares I crew launch vehicle and designing the Ares V cargo launch vehicle, in addition to establishing the Integrated Lunar Network and supporting a host of scientific missions. Prior to this position, Mr. Dumbacher was Deputy Director of the Ares Projects Office and was Deputy Director for Product Assurance in the Safety and Mission Assurance Office during the Shuttle's return-to-flight activities. Before his appointment as Deputy Manager of the Space Launch Initiative, he led the DC-XA and X-33 flight demonstrator projects. He served as Assistant Manager of the Space Shuttle Main Engine Project and later managed that project from NASA Headquarters. He was Chief Engineer for the Space Shuttle Main Engine Alternate Turbopump Project and worked for a time in private industry with Teledyne Brown Engineering. He began his NASA career in 1979 as a liquid propulsion engineer, working closely with Saturn-era engineers to develop the Shuttle's propulsion system. Mr. Dumbacher received his bachelor's degree in mechanical engineering from Purdue University and a Master's in Administrative Science from the University of Alabama in Huntsville. He has authored



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numerous papers on liquid propulsion and systems engineering, and recently presented the keynote speech at Purdue's Global Engineering Colloquium. Mr. Dumbacher was named Purdue's Outstanding Mechanical Engineer of the Year in 2003 and received the Presidential Rank Award for Meritorious Executives in 2007.

Christopher E. Singer
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Christopher (Chris) E. Singer is Deputy Director of the Engineering Directorate at the Marshall Space Flight Center, where he leads a workforce dedicated to designing, testing, evaluating, and operating hardware and software associated with space transportation, spacecraft systems, science instruments, and payloads being developed and managed by Marshall. Before this assignment he served as Chief Engineer, Deputy Director, and Acting Director of the Space Transportation Directorate. He was the Technical Assistant to the Space Shuttle Main Engine Project Manager and later took an assignment at NASA Headquarters as Senior Manager of the Space Shuttle Main Engine and External Tank in the Space Shuttle Support Office. He began his NASA career in 1983 as a rocket engine specialist in the Structures and Propulsion Laboratory. Mr. Singer holds a bachelor's degree in mechanical engineering from Christian Brothers University in Memphis, TN. The author of numerous papers on space transportation systems and operations, Mr. Singer delivered the keynote address on "Success Through Failure" at Christian Brothers University's 50th anniversary. He has received numerous awards, including a Silver Snoopy from the Astronaut Corps and the Presidential Rank Award for Meritorious Executives in 2006.